TEMPERED GLASS.

RESULTS ATTAINED BY A DRESDEN MANUFACTURER.

The Toughening Process of De la Bustle and Its Fallure-Mr. Frederick Siemens' Methods - Hardened Glass by Simple Processes.

(Philadelphia Record.)

When a piece of ordinary glassware is blown or cast in a mold the subsequent cooling process does not equally affect all its parts and surfaces, and its molecules are consequently thrown into a state of tension or strain. The brittle quality resulting from this c mdition has become a popular synonym for weakness and unreliability, and it has long been the most formidable obstacle to a proper development of the glass manufacturing industry. For many years glassmakers have sought for some process by which glass might be made as stout as castiron and as hard as its original quartz, while retaining the pliability in manufacture that has made it a thing of universal use and necessity. Such a discovery would be followed by many important changes in manufactures, in architecture, and in many of the appliances and implements of daily life. A material as strong as iron and of but one-fourth its weight, and susceptible of an almost infinite variety of decoration, would unque tionably be a new and important resource in the hands of civilization.

In their search for this new material the In their search for this new material the glassmakers have not been entirely unsuccessful, although the result of their labors up to this time is shown only by a few fragmentary wares, which have hardly attracted public notice. The way to success is difficult and new chemical compounds, independent of present manufacturing processes, may be required before the desired end is attained. The temperature process of the leasting. The toughening process of De la Basics, which promised so much ten years ago, had dropped into abeyance, and nothing useful is anticipated from it in the future. It con-

is anticipated from it in the future. It consisted simply in heating the glass and plunging it immediately into hot oil. The articles thus toughened were always liable to break spontaneously into fragments; but, generally speaking, unless broken very soon they would last a long time.

But this process presents many difficulties. It is not adapted to all forms of glasmanufacture, and the percentage of loss by breakage is very large. The cause of the breakage is inherent in the operation itsel, which cools the articles in proportion to their bulk, and thus induces a molecular strain likely at any time, to cause complete rupture. This commercial objection, to gether with the difficult and uncertain character of the process, has prevented Decharacter of the process, has prevented De la Bastle's method from producing a sensi-ble impression upon the glass manufactur-ing process of the world. Like many other clever novelties, it has been interesting from a scientific standpoint, but a failure com-

But if De la Bastie has failed in attaining his object, he has at least pointed the way through which others may reach the prize. Six years ago Frederick Siemens, then already of established reputation as a practical scientist and man of affairs, began at his Dresden glass-works the production by original processes of toughened, or, as he prefera to call it, hardened glass. The value of his output for the first year was \$3,000 and there has been a steady annual increase until last year it amounted to over \$35,000.

Mr. Siemens describes his method at length in a paper which he recently read before the London Society of Arts. They include three distinct processes—presshardening, casting, and hard-tempering—and all these are based upon the principle of absolutely uniform heating and cooling. This means simply that at any given instant in the processes of lisating and cooling every portion of the article shall be of exactly the same temperature. The devices to secure this end are varied according to the various shapes to be treated. In practice it has been found somewhat difficult to attain the require! But if De la Bastie has failed in attaining somewhat difficult to attain the required theoretical perfection; but this is not a matter of so much importance, since technical skill will follow upon experience.

Mr. Siemens seems to have hit upon the right path, which, in the matter of production to a seem to be a seem to

Mr. Siemens seems to have hit upon the right path, which, in the matter of producing tempered glass, is the principal consideration. His work: for producin hardened glass already furnish flat or bent material in plate or sheet glass, decorated sheets of any desired device, enameled glass of a very superior quality, bottles, lamp-chimneys an other hollow ware. A new department is now almost in readiness for the production of railway ties, mantels, architectural derigns in various tints, floor-beams an plates, and other large castings. All the earticles are from four to eight times a strong as ordinary glass. They are so bard that they cannot be cut with a diamon!, nor will they split when slightly fractured. The Siemens hardened glass, in fact, appears to occupy the same relation to ordinary glass that steel now bears to iron.

The processes employed by Mr. Siemen are really simple; the difficulty has been in learning their proper application. Flat or bent articles are press-hardened by being squeezed tightly, while in an almost moiten condition, between two heavy plates of metal. The more rapid the cooling the harder and tougher the glass. Castings are made in molds which have the same conductivity as glass, and in every mold each exterior point is at the same distance from

ductivity as glass, and in every mold each exterior point is at the same distance from the uriace of the casting. Hard-temperium is effected by inclosing the heated article i a calting of sheet-iron, equidistant at all points from its surface, and cooling both together. This latter process is applicable

only to glass of the same thickness througa-out. The articles treated by it are three time as strong as ordinary glass, and hav found much favor among buyers.

Pro-hardened glass has been adopted for use on the great ironclade of the British navy, where the concussion of heavy guns shateers common glass, but produces no effect upon the improved article. The street lights of Dresden and Berlin are protected by hardened glass, and are proof again t any but the heaviest missiles, the breaking being now but one-tenth what they formerly were. Mr. Siemens showed by experimentvera. Mr. Siemens showed by experiment that pieces of common sheet-glass broke when a cricket ball was dropped upon them. from an average height of two feet, while a blow from a height of from five to five and one-half feet was required to break the tempered glass.

Growth of Cereals.

[Arkansaw Traveler.]
From careful researches in Russia, Kowalewski has found that cereals grow faster in the north than in the south. For instance, cats and spring wheat take 123 days and the county of the county days at Arkhangelsk in the north. The intermediate regions show intermediate differences. The cause is the greater length of the daily exposure to sunlight in the high latitudes, which more than compensates for the daily exposure to sunlight in the high latitudes, which more than compensates for the daily exposure to sunlight in the high latitudes, which more than compensates for the daily exposure to sunlight in the assister a parts of Russia than in the western, the land near the coast having less sunshine than that in the continent's intrior.

Mexican Schools.

[Atlanta Constitution]

If we don't look out the Mexican state will get shead of us in the matter of free squentson. The state of Pueblo alone he 2000 free schools. The popular interest seatons are rong that the liquit energy of the state of Pueblo alone he appears to the first popular interest state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the state is pow on a right of the source of the source of the state is pow on a right of the source of the s barley 110 days to ripen about the southern province of Kherson, and only 99 88 and 98 days at Arkbangolsk in the north. The in-

2,000 free schools. The popular interest is a strong that the lieut-near governor of the state is now on a visit to this country again ining our educational system.

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Tin Plate, Sheet Lead, Galvanized Water Pipe
(by to r inches),
White Lead, (various qualities),
Boiled Oil, Turpentine,
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Cases Fairban
Cases Fairban
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Haif bhla. Butter, Pickle Roll,
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Boxes Currants,
Cases Chocolate,
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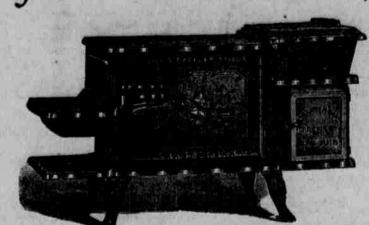
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